

# ATM CONNECTION BAND CONTROL METHOD AND CONTROL SYSTEM

## BACKGROUND OF THE INVENTION

### Field of the Invention

5           The present invention relates generally to an asynchronous transfer mode (ATM) connection band control method and a control system. More particularly, the invention relates to an ATM connection band control method and a system effectively using connection bands which respective ATM circuit ports have.

### 10   Description of the Related Art

          In Fig. 9, the conventional ATM connection band control system includes an input circuit 1, an input buffer control portion 2c, an ATM switch control portion 3c and an output buffer control portion 4.

15           The input buffer control portion 2c includes a buffer accumulation memory 21c for accumulating input cells before feeding to an ATM switch, an input buffer function portion 22c performing writing control of ATM cells to a buffer accumulation memory and queue management of the buffer, a usage parameter  
20   control (UPC) portion 23c monitoring whether a traffic of a user in communication exceeds a band declared upon switched virtual connection (SVC) setting demand or not, a connection admission control (CAC) portion 24c controlling whether a demand is to be admitted or not upon reception of signaling of connection  
25   setting demand for new SVC of constant bit rate (CBR), a real

time variable bit rate (rt-VBR), a non-real time variable bit rate (nrt-VBR), a buffer control memory 26c storing parameter or data necessary for operation of the input buffer function portion 22c and the usage parameter control (UPC) portion 23c, 5 and a circuit interface control portion 20c interfacing the input buffer function portion 22c and the input circuit 1 for feeding the input cell to the ATM switch.

The ATM switch control portion 3c includes an ATM switch 30c performing switching of the ATM cell, CPU 31c performing 10 central control process of overall system and a main memory 32c for residence of operation program or data necessary for operation of CPU 31c.

Fig. 10 is a detailed block diagram showing a buffer control memory 26c relating to the connection band of SVC of Fig. 9 15 and its peripheral control portion. The buffer control memory 26c includes a memory 261c storing band data per declared connection upon SVC setting demand necessary for control operation of the usage parameter control (UPC) portion 23c, a memory 263c storing connection band data of SVC of CBR, rt-VBR, 20 nrt-VBR, and a memory 264c for storing data necessary for other connection admission control, such as available band of ATM circuit port and so forth.

Only connection band data of SVC of currently established connection is present in the buffer control memory 26c for 25 performing connection admission control and connection band

control.

In this case, the connection band control and the connection admission control is performed for acquiring necessary connection band in first-come-first-set order without  
5 considering connection band of preferential SVC when the SVC of established connection issues setting demand. Therefore, when connection of the preferential SVC is not yet established and issue setting demand for connection later, the SVC setting demand is not always admitted and can be rejected until the  
10 necessary band is released in certain remaining band of the ATM circuit port.

On the other hand, even when the connection of the preferential SVC is established, if the preferential SVC is deleted once, the connection band acquired unconditionally is  
15 released. Therefore, even when the preferential SVC issues setting demand again, there is not guarantee to acquire connection band. If other SVC sets the connection earlier, the setting demand may be rejected until the necessary band is released in certain remaining band of the ATM circuit port.

20 In the foregoing conventional ATM band control method, the first problem is that, in acquiring of the connection bands of each SVC of the CBR, rt-VBR, nrt-VBR requiring fixed band, the connection admission control (CAC) performing control on the basis of the band information of those actually established  
25 connection to acquire the band for those established connection

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at earlier timing for finite connection bands of each ATM circuit port. However, judgment is not made whether acquiring of band has to be done preferentially or not.

5 The second problem is that there is not means for preliminarily registering data for setting the band of the connection to be preferentially assigned without actually establishing connection and making judgment upon establishing connection.

10 The third problem is that when connection for SVC having high preference (preferential SVC) among SVCs is temporarily released for some hindrance to open the band, if the preferential SVC is recovered from hindrance and the preferential SVC demands resetting of connection and connection setting demand for other SVC having low preference (non-preferential SVC) is done at  
15 earlier timing, since connection setting of the non-preferential SVC is performed normally, there is no guarantee for permitting resetting of the preferential SVC. Therefore, whether resetting of connection is successful or not simply depends on remaining band of the ATM circuit port.

20 On the other hand, the fourth problem is that there is no means for performing control for ensuring and guaranteeing resetting of connection band for the preferential SVC when the connection band of the SVC having high preference, such as CBR or the like is temporarily deleted and the band is opened, and  
25 when the connection setting demand is issued by other SVC having

lower preference while the connection of the preferential SVC is deleted. The connection band is inherently acquired in order to demanding of setting irrespective of preferential order. Therefore, for the SVC having high preference while not used constantly, connection has to be maintained irrespective whether the connection is used for communication or not to constantly occupy the connection band.

The fifth problem is that even when the SVC having high preference actually occupies the connection band constantly, the band may be used for the SVC of ATM category service which does not require fixed band, such as available bit rate (ABR), unspecified bit rate (UBR) and so forth as long as not cell flows in the connection. However, in the prior art, even when the connection is not actually used, an idle data is transmitted in CBR, the band acquired by CBR may not be released unless the setting of connection is actually deleted.

#### SUMMARY OF THE INVENTION

The present invention has been worked out for solving the problems as set forth above.

According to the first aspect of the present invention, an asynchronous transfer mode connection band control method in a system for transmitting and receiving an asynchronous transfer mode cell using an asynchronous transfer mode network, comprises:

first step of preliminarily setting a connection band

as band acquiring data for preferential switched virtual connection having high preference in the asynchronous transfer mode network among connections of an asynchronous transfer mode service categories requiring a fixed band, of constant bit rate, 5 in which a traffic is generated at a constant interval in the switched virtual connection via the asynchronous transfer mode network, and a real time variable bit rate or non-real time variable bit rate generating a variable traffic having burst characteristics in transmission rate, such as variable rate 10 video or public network frame relay service; and

second step of controlling the connection band including the band acquiring data for enabling cooperation with a connection admission control for the constant bit rate, the real time asynchronous transfer mode and the real time variable 15 bit rate and the non real-time variable bit rate, and performing reception control under a condition where the band for the preferential switched virtual connection is constantly acquired, with controlling the connection band in a range where a band for the preferential switched virtual connection is constantly 20 acquired and guaranteed, a band for a non-preferential switched virtual connection can be constantly acquired upon the connection admission control for the non-preferential switched virtual connection.

In the preferred embodiment, it is preferred that in the 25 first step, the connection band of the constant bit rate, the

realtime variable bitrate and the non-realtime switched virtual connection, is preliminarily set and stored in a buffer control memory irrespective whether a connection of the preferential switched virtual connection is established or not, and in the  
5 second step, control is performed with taking the preliminarily set band acquiring data and data necessary for the connection admission control of other connection including the connection band of the switched virtual connection used currently and data necessary for connection admission control.

10 In the second step, upon reception of a signal for setting demand of new switched virtual connection from a calling terminal, judgment may be made whether the switched virtual connection is the preferential switched virtual connection having high preference and having band being acquired.

15 In the second step, when the new switched virtual connection setting demand from the calling terminal is for a non-preferential switched virtual connection, connection band may be controlled within a range where the band of the preferential switched virtual connection is certainly  
20 maintained irrespective whether the connection of the preferential switched virtual connection, for which the band is already reserved, is established or not by cooperation of a connection reception control processing portion and a connection band controller.

25 In the second step, when the new switched virtual

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connection from the calling terminal is the preferential  
switched virtual connection, for which band has already been  
reserved, connection admission may be controlled under a  
condition where a band of the preferential switched virtual  
5 connection within a range where the band of the preferential  
switched virtual connection is certainly maintained.

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10 Data of connection band of the preferential switched  
virtual connection of the constant bit rate, the real time  
variable bit rate and the non-real time variable bit rate is  
set irrespective whether the connection for the switched virtual  
connection is established or not, and for the preferential  
switched virtual connection, connection admission control and  
connection band control may be performed for constantly  
acquiring the band.

15 According to the second aspect of the present invention,  
an asynchronous transfer mode connection band control system  
in a system for transmitting and receiving an asynchronous  
transfer mode cell utilizing an asynchronous transfer mode  
network, comprises:

20 data storage means for storing a connection band of a  
preferential switched virtual connection having high preference  
in the asynchronous transfer mode network being stored  
preliminarily as a band acquiring data and storing acquired  
band data of a switched virtual connection currently established  
25 connection; and



connection band control means for performing control of connection band on the basis of a total number of bands derived by a sum of the band acquiring data and the acquired band data stored in the data storage means.

5           According to the third aspect of the present invention, an asynchronous transfer mode connection band control method in a method for transmitting and receiving an asynchronous transfer mode cell utilizing an asynchronous transfer mode network, comprises:

10           providing data storage means for storing a connection band of a preferential switched virtual connection having high preference in the asynchronous transfer mode network being stored preliminarily as an band acquiring data and storing acquired band data of a switched virtual connection currently  
15           established connection; and

connection band control step of performing control of connection band on the basis of a total number of bands derived by a sum of the band acquiring data and the acquired band data stored in the data storage means.

20           In the preferred construction, the connection band control means or the connection band control step may add the band acquiring data of the connection band of the switched virtual connection when setting demand for acquiring the connection band for the switched virtual connection is issued and the demand  
25           is admitted.

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demand is issued and the switched virtual connection is the preferential switched virtual connection for which the band data is preliminarily acquired.

#### BRIEF DESCRIPTION OF THE DRAWINGS

5           The present invention will be understood more fully from the detailed description given hereinafter and from the accompanying drawings of the preferred embodiment of the present invention, which, however, should not be taken to be limitative to the invention, but are for explanation and understanding  
10 only.

In the drawings:

Fig. 1 is a schematic block diagram of the preferred embodiment of an ATM connection band control system according to the present invention;

15           Fig. 2 is a detailed block diagram of the major part of the first embodiment of the ATM connection band control system according to the present invention;

Fig. 3 is a flowchart showing operation of the first embodiment of the ATM connection band control system according  
20 to the invention;

Fig. 4 is a flowchart showing operation of the first embodiment of the ATM connection band control system according to the invention;

Fig. 5 is a flowchart showing operation of the first  
25 embodiment of the ATM connection band control system according

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to the invention;

Fig. 6 is a block diagram of the major part of the second embodiment of the ATM connection band control system according to the present invention;

5 Fig. 7 is a block diagram of the major part of the third embodiment of the ATM connection band control system according to the present invention;

Fig. 8 is a block diagram of the major part of the fourth embodiment of the ATM connection band control system according  
10 to the present invention;

Fig. 9 is a block diagram showing the conventional ATM connection band control system; and

Fig. 10 is a detailed block diagram showing a part of the prior art.

15 DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention will be discussed hereinafter in detail in terms of the preferred embodiment of the present invention with reference to the accompanying drawings. In the following description, numerous specific details are set forth  
20 in order to provide a thorough understanding of the present invention. It will be obvious, however, to those skilled in the art that the present invention may be practiced without these specific detailed. In the other instance, well-known structures are not shown in detail in order to avoid unnecessary  
25 obscurity of the present invention.

Fig. 1 is a block diagram showing the first embodiment of an ATM connection band control system according to the present invention. The shown embodiment of the ATM connection band control system includes an input circuit 1, an input buffer control portion 2, an ATM switch control portion 3 and an output buffer control portion 4.

The input buffer control portion 2 includes a buffer accumulation memory 21 for accumulating an input cell before feeding an ATM switch, an input buffer function portion 22 performing queue management of a control buffer for writing an ATM cell in the buffer accumulation memory 21, a usage parameter control (UPC) portion 23 monitoring whether a traffic of the user in communication exceeds a band declared upon demanding setting of SVC or not, a connection admission control (CAC) portion 24 controlling whether a demand is to be admitted or not upon reception of signaling of connection setting demand for new SVC of CBR connection generating a traffic at a predetermined interval via an ATM network from a calling terminal, such as voice, rt-VBR connection or nrt-VBR having variable traffic, in which a transmission rate has burst property, such as variable rate video or a public network frame relay service, a connection band controller 25 performing management or judgment control of connection band data of SVC required for control operation of the connection admission control (CAC) portion 24 and data necessary for other connection admission

control such as available band of the ATM circuit port and so forth, buffer control memory 26 for storing parameters and data necessary for operation of the input buffer function portion 22, the usage parameter control (UPC) portion 23, the connection admission controller (CAC) portion 24 and the connection band controller 25, and the interface control portion 20 for interfacing between the input buffer function portion 22 for feeding the input cell to the ATM switch and the input circuit 1.

10           It should be noted that the connection admission controller (CAC) is a control whether the demand is to be admitted upon receiving signaling of demand of connection setting for the SVC of CBR, rt-VBR and nrt-VBR of ATM service category requiring fixed band, and is a control held inoperative upon  
15   receiving signaling of demand of connection setting for the SVC of ABR or UBR in another ATM service category.

The ATM switch control portion 3 includes an ATM switch 30 performing switching of ATM cell, CPU 31 performing central control process of overall system and a main memory for residence  
20   of operation program and data necessary for operation of CPU 31. Fig. 2 is a block diagram showing the buffer control memory 26 relating to the connection band of the SVC and peripheral control portion.

The buffer control memory 26, as data structure in the  
25   memory 25 storing the buffer control memory data, includes a

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memory 261 storing a band data per connection declared upon  
SVC setting demand necessary for control operation of the usage  
parameter control (UPC) portion 23, a memory 262 storing band  
data to preliminarily acquire connection band of the  
5 preferential SVC necessary for control operation of the  
connection band controller 25, a memory 263 storing connection  
band data of the SVC of CBR, rt-VBR and nrt-VBR established  
current connection, and a memory 264 storing data necessary  
for connection admission control, such as available band and  
10 so forth of ATM circuit port.

Next, operation of the shown embodiment will be discussed  
with reference to the drawings. SVC setting demand signaling  
for establishing connection of the SVC received from the ATM  
network is fed to the input buffer control portion 2 from the  
15 input circuit 1 of Fig. 1 similarly to ATM cell.

At this time, in the input buffer control portion 2, the  
judgment and control whether the writing and reading in and  
from the buffer accumulation and the new SVC setting demand  
by the connection admission control portion 24 are to be accepted  
20 or not are performed.

Next, operations of the connection admission control  
portion 24, the connection band controller 25, the buffer control  
memory 26 and the usage parameter control portion 23 in Figs.  
1 and 2 will be discussed with reference to Figs. 3 and 4. In  
25 operational flowchart for acquiring connection band of Fig.

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3, upon occurrence of setting demand for acquiring connection  
band for the SVC, content of setting demand of the SVC is checked  
at step S101. Thereafter, at step S102, judgment is made whether  
the SVC in question is the setting demand for acquiring the  
5 connection band of the preferential SVC preliminarily acquired  
band data presenting in the memory 262 which stores the band  
acquiring data of Fig. 2.

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10 A criterion for making judgment whether the SVC, for which  
setting is demanded, is the preferential SVC, for which the  
band data is preliminarily acquired, or not, can be made by  
data which the SVC inherently have upon establishing connection,  
or a combination of a plurality of data.

As inherent data which the SVC should have upon  
establishment of connection, there are a virtual path identifier  
15 (VPI) value, a virtual channel identifier (VCI) value, an input  
and output port (number) of the SVC of CBR, rt-VBR, nrt-VBR,  
ABR, UBR and so forth, and a peak cell rate (PCR), a sustainable  
cell rate (SCR), a maximum burst size (MBS) as traffic parameter  
defined at an ATM Forum Traffic Management Specification Version  
20 4.0 (af-tm-0056.000, April, 1996 : hereinafter referred to as  
"TM4.0") and so forth. By one of these or a combination of  
a plurality of data, the SVC is specified to make judgment whether  
the setting demanded SVC is the preferential SVC, for which  
the band data is preliminarily acquired, or not.

25 When the setting demanded SVC is the preferential SVC,



for which the band data is preliminarily acquired, a process for guarding double registration to the memory 262 storing the connection band acquiring data of Fig. 2 is performed by the connection band controller 25 (S103) to terminate the process  
5 for connection band acquiring.

On the other hand, when the setting demanded SVC is not the preferential SVC, for which the band data is preliminarily acquired, a total band number derived by a sum of the current band acquiring data stored in the memory 262 and the acquired  
10 band data stored in the memory 263 is calculated as a band acquiring judgment reference data (S104). On the basis of the band acquiring judgment reference data and data necessary for other CAC, judgment whether setting demand for acquiring connection band of SVC is admitted or not, is made by the  
15 connection band controller 25 (S105).

When judgment is made that the setting demand for connection band acquiring can be admitted in the judgment whether the setting demand of the connection band acquiring of SVC (S106) is accepted or not, process is performed to add the connection  
20 band of the SVC to be acquired in the memory 262 storing the band acquiring data in the connection band controller 25 (S107).

On the other hand, at step S106, when judgment is made that the setting demand of connection band acquiring cannot be admitted, for the setting demand of connection band acquiring  
25 of SVC, rejection is notified (S108). Then, process for

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acquiring connection band is terminated.

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10 5 In operational flowchart of the connection admission control of Fig. 4, upon occurrence of SVC setting demand S201, the content of the setting demand of SVC is checked to make judgment whether the SVC in question is the preferential SVC already acquired the band data presenting in the memory 262 which stores the band acquiring data of Fig. 2, at step S202. As criterion for making judgment whether the SVC setting demand is the connection setting demand of the preferential SVC, for which the band data is already acquired, or not, the judgment can be made by data which the SVC inherently have upon establishing connection, or a combination of a plurality of data similarly to step S102 of Fig. 3. By specifying the SVC, judgment is made whether the setting demanded SVC is the preferential SVC which has been acquired preliminarily or not.

20 15 Since the SVC is the preferential SVC which has been acquired the connection band via the operation flow including judgment of setting shown in Fig. 3, the result of judgment at step S202 indicates that the SVC setting demand can be admitted when the SVC for which setting is demanded is the preferential SVC for which the band data is acquired preliminarily (S203). Accordingly, the process for transferring the demanded connection band data from the memory 262 which stores band acquiring data to the memory 263 storing the acquired band data, is performed by the connection band controller 25 (S204). Then,

to the connection admission control portion 24, execution of the acceptable process for the SVC setting demand is notified (S209).

On the other hand, if the SVC for which setting is demanded is not the preferential SVC preliminarily acquired the band data, the total band number is derived from the sum of the content of the memory 262 storing the band acquiring data and the content of the memory 263 storing the acquired band data, as the band admission judgment reference data (S205). Then, on the basis of the band admission judgment reference data and data necessary for other CAC, judgment is made whether the SVC setting demand is to be admitted or not by the connection band controller 25 (S206).

By the judgment whether the SVC setting demand is to be admitted or not (S207), if the SVC setting demand is judged as acceptable, process is performed in the connection band controller 25 for adding the connection band data of the demanded SVC in the memory 263 storing the acquired band data (S208). Then, similarly to the case where the SVC for which setting is demanded at step S202 is the preferential SVC for which the band data is preliminarily acquired, execution of the admission process for the SVC setting demand is notified to the connection admission control portion 24.

After notification of admission process at S209, the band data per connection declared upon SVC setting demand is

registered in the memory 261 which stores the band data per connection, by the connection admission control portion 24 (S210). On the other hand, by making judgment whether the SVC setting demand is to be admitted or not at step S207, rejection  
5 of admission for the SVC setting demand is notified to the connection admission control portion 24 (S211). Then, the process of accepting connection of the SVC is terminated.

In an operational flowchart of connection deletion control of Fig. 5, upon occurrence of SVC setting deletion demand  
10 at step S301, the SVC to be deleted is checked. At step S302, judgment is made whether the SVC in question is the preferential SVC already acquired the band data in the memory which stores the band acquiring data of Fig. 2, or not. Here, as criterion for making judgment whether the connection setting demand of  
15 the preferential SVC, for which the band data is already acquired, the judgment can be made by data which the SVC inherently have upon establishing connection, or a combination of a plurality of data similarly to step S102 of Fig. 3. By specifying the SVC, judgment is made whether the setting demanded SVC is the  
20 preferential SVC which has been acquired preliminarily.

Since the SVC is the preferential SVC which has been acquired the connection band via the operation flow including judgment of setting shown in Fig. 3, the result of judgment at step S302 indicates that the SVC for which deleting is demanded  
25 is the preferential SVC for which the band data is acquired

preliminarily, the process for transferring the demanded connection band data from the memory 263 which stores acquired band data to the memory 262 storing the band acquiring data, is performed by the connection band controller 25 (S303). Then, process for the SVC setting deletion demand is executed to delete the connection band data declared upon demanding SVC setting from the memory 261 which stores the band data per connection (S304). Then, a process for deleting setting of SVC is terminated.

On the other hand, the result of judgment at step 302 indicates that the SCV for which deleting is demanded is not the preferential SVC for which the band data is acquired preliminarily, the process for deleting the deleted connection band data from the memory 263 which stores acquired band data, is performed by the connection band controller 25 (S305). Then, process for the SVC setting deletion demand is executed to delete the connection band data declared upon demanding SVC setting from the memory 261 which stores the band data per connection (S304). Then, a process for deleting setting of SVC is terminated, as the result of judgment as step 302 indicates that the SVC for which deleting is demanded is the preferential SVC for which the band data is acquired preliminarily.

Next, discussion will be given for the second embodiment of the ATM connection band control system according to the present invention. In the shown embodiment illustrated in Fig. 6, the

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usage parameter control (UPC) portion 23 and the memory 261  
storing the band data per connection declared upon SVC setting  
demanding performs control and function for setting and deleting  
connection of the SVC. On the other hand, the connection  
5 admission control (CAC) portion 24 and a memory 764 storing  
data necessary for other CAC, such as available band of the  
ATM circuit port, perform setting and deletion of connection  
of SVC of CBR, rt-VBR and nrt-VBR. Concerning a memory 762  
storing connection band data to be preliminarily set as band  
10 acquiring data of the connection band, a memory 763 storing  
the connection band data of CBR, rt-VBR and nrt-VBR which has  
already been established connection, and the connection band  
controller 25 which controls these connections are performed  
not only for the SVC but also for permanent virtual circuit  
15 (PVC).

Concerning the permanent virtual connection (PVC),  
similarly to the connection band control of SVC, the memory  
762 storing the band data preliminarily acquiring the connection  
band of the connection having high preference (hereinafter  
20 referred to as "preferential connection") irrespective of PVC,  
SVC for connection, such as CBR, rt-VBR, nrt-VBR of ATM service  
category requiring fixed band having values of a program clock  
reference (PCR), SCR, MBS defined in T.M4.0, the memory 763  
storing the band data of the preferential connection currently  
25 established, and a memory 260A storing data necessary for other

connection admission such as available band of the ATM circuit  
port are formed to enable preliminarily set the band acquiring  
data necessary for preferential connection irrespective either  
PVC or SVC. Also, concerning SVC, cooperation with the  
5 connection admission control is possible.

By connection band control including the band acquiring  
data in the connection band controller 25 irrespective of PVC,  
SVC, the connection band having low preference, for which  
constantly acquiring and guaranteeing the band is not required,  
10 is controlled within a range where band for the preferential  
connection is constantly acquired and guaranteed when the  
connection band for non-preferential connection is to be  
controlled. For the preferential connection, control of band  
of the preferential connection including admission control of  
15 the preferential SVC among the preferential connection is  
performed, for which the band is constantly acquired and  
guaranteed irrespective whether the connection of the  
preferential SVC is established or not. Thus, finite connection  
bands of each ATM circuit port can be used efficiently.

20 Next, discussion will be given for the third embodiment  
of the ATM connection band control system with reference to  
the drawings. In Fig. 7, the shown embodiment is differentiated  
from the ATM switch control portion in the embodiment shown  
in Fig. 2 in that a connection setting control portion 733 is  
25 provided in an ATM switch control portion 3A. The connection

setting control portion 733 controls setting of connection of the preferential SVC, for which the required band is preliminarily set as the band acquiring data.

By this, since the band required for the preferential  
5 SVC is constantly acquired and guaranteed, the preferential SVC can be set and deleted as required by the connection setting control portion 733. For the connection of the SVC of ABR or UBR which does not require the fixed band and is not controlled by the connection admission control (CAC) portion 24 and the  
10 connection band controller 25, when the preferential SVC is unnecessary, namely when connection for the preferential SVC is not established, the band reserved for the preferential SVC is available for the SVC of ABR or UBR. Thus, the finite connection band of each ATM circuit port can be effectively  
15 used. On the other hand, when the preferential SVC becomes necessary, namely, when the connection for the preferential SVC is to be established, the band for the preferential SVC is acquired cutting into the band for the SVC of the ABR or UBR. Therefore, even when setting of connection for the  
20 preferential SVC is established later, communication of the preferential SVC can be established normally.

Next, discussion will be given for the fourth embodiment of the ATM connection band control system according to the present invention with reference to Fig. 8. The shown embodiment is  
25 differentiated from the ATM switch control portion 3 in the

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first embodiment shown in Fig. 2, in that a connection-setting  
portion 833 of an ATM switch control portion 3B is provided.  
Also, a memory 762 for storing band acquiring data of the  
preferential connection in a buffer control memory 26B and a  
5 memory 763 storing acquired band data of PVC or SVC are  
differentiated from the memory 262 storing the band acquiring  
data of the preferential SVC and the memory 263 storing the  
acquired band data of SVC.

The connection-setting control portion 833 of Fig. 8  
10 controls setting of the preferential connection, for which the  
band required irrespective of PVC or SVC is preliminarily set  
as the band acquiring data.

By this, since the band necessary for the preferential  
connection is constantly acquired and guarantee, the  
15 preferential connection irrespective of PVC or SVC can be set  
and deleted as required by the connection-setting control  
portion 833. For the connection of the SVC of ABR or UBR which  
does not require the fixed band and is not controlled by the  
connection admission control (CAC) portion 24 and the connection  
20 band controller 25, when the preferential SVC is unnecessary,  
namely when connection for the preferential SVC is not  
established, the band reserved for the preferential SVC is  
available for the SVC of ABR or UBR. Thus, the finite connection  
band of each ATM circuit port can be effectively used.

25 On the other hand, when the preferential SVC becomes

necessary, namely, when the connection for the preferential SVC is to be established, the band for the preferential SVC is acquired cutting into the band for the SVC of the ABR or UBR. Therefore, even when setting of connection for the  
5 preferential SVC is established later, communication of the preferential SVC can be established normally.

As set forth above, by cooperating the connection band control and the connection setting control, the band for the preferential connection can be constantly and certainly  
10 acquired and guaranteed for the preferential connection. Also, for the connection of ABR or UBR which does not require preferential connection or when the preferential connection is not established, the band becomes open to the ABR or UBR to permit effective use of finite number of connection bands  
15 in each ATM circuit port.

On the other hand, by managing the connection setting control by a schedule or the like, the necessary band is used for establishing connection only in a time zone which requires preferential connection, and in the time zone where the  
20 preferential connection is not required, control for temporarily deleting connection is performed in the connection setting control. The connection setting control is also cooperated with the connection band control, during the period where the preferential connection is temporarily deleted, the  
25 connection setting demand for the connection requiring the fixed

band is not admitted, and for the connection which does not require the fixed band, the band is opened to more effectively use the finite connection bands of each ATM circuit port.

As set forth above, in the shown embodiment, by  
5 preliminarily setting the connection band for the preferential SVC in the ATM network as the band acquiring data to perform connection band control including the band acquiring data, and by cooperating with the connection admission control, during connection admission control for the SVC which has low preference  
10 and reservation of the bands is unnecessary, the band for the preferential SVC can be certainly acquired and guaranteed. On the other hand, at the same time, for the preferential SVC, connection band control including the connection admission control can be realized under the condition where the band for  
15 the preferential SVC is constantly acquired and guaranteed irrespective whether the connection is currently established or not to more effectively use the finite connection bands of each ATM circuit port.

For example, for the connection of the SVC having high  
20 preference (preferential SVC), even when established connection is temporarily broken by certain failure to open the band, the connection admission control is realized in the condition where the connection band of the preferential SVC is certainly acquired and guaranteed, for the connection setting demand of the SVC  
25 of low preference which connection of the preferential SVC is

held broken. Furthermore, even when the connection setting demand of the preferential SVC is issued the acquired and guaranteed bands is again demanded to ensure establishment of connection again.

5           As set forth above, in accordance with the present invention, the first effect is capability of connection band control in a range where the band for the SVC of high preference and being set the band preliminarily, is acquired and guaranteed constantly upon connection admission control for the SVC of  
10 low preference and acquiring of the band being not required, by preliminarily setting the connection band of the SVC having high preference (i.e. preferential SVC) which is one of CBR, rt-VBR or the nrt-VBR requiring fixed band, and by performing connection band control with as band acquiring.

15           The second effect is that, with the band setting for the SVC having high preference as set forth in the first embodiment, upon connection admission control for the SVC which does not require reservation of control, and by performing connection band control in the range where the band for the SVC for which  
20 the band is reserved is constantly acquired and guaranteed, for the SVC of high preference, connection band control including connection admission control can be performed under the condition where the band for the SVC of high preference is constantly acquired and guaranteed irrespective whether the  
25 connection of the preferential SVC is established or not.

Although the present invention has been illustrated and described with respect to exemplary embodiment thereof, it should be understood by those skilled in the art that the foregoing and various other changes, omission and additions  
5 may be made therein and thereto, without departing from the spirit and scope of the present invention. Therefore, the present invention should not be understood as limited to the specific embodiment set out above but to include all possible embodiments which can be embodied within a scope encompassed  
10 and equivalent thereof with respect to the feature set out in the appended claims.

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